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December 3, 2015

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Notice of Oral Ex Parte Presentation
GN Docket No. 12-354

Dear Ms. Dortch:

On December 2, 2015, Chris Daniels, General Manager, North America for Telrad Networks, Ltd. ("Telrad"), Patrick Leary, Director of Business Development, North America for Telrad, and undersigned counsel to Telrad met with staff of the Commission's Office of Engineering and Technology and the Wireless Telecommunications Bureau.[1]

Messrs. Daniels and Leary presented the attached slides, which provide information on Telrad's development of LTE technology in the 2.5 GHz and 3.5 GHz bands and successful deployments throughout North America. In addition, they explained that a number of potential customers in the United States had placed their fixed broadband deployment plans on hold in light of the Commission's adoption of a freeze on the granting of new licenses in the 3650-3700 MHz band.

Pursuant to Section 1.1206 of the Commission's Rules, this letter is being filed electronically via the Electronic Comment Filing System in the above-captioned proceeding.

Respectfully submitted,

Stephen E. Coran

Enclosure

[1] The staff members who attended the meeting are listed at the end of this letter. Messrs. Buenzow and Lambert attended via telephone.

cc: Julius Knapp
Brian Regan
Ira Keltz
Paul Powell
Chris Helzer
Kamran Etemad
Navid Golshahi
Robert Pavlak
Becky Schwartz
Stephen Buenzow
John Lambert

Telrad Networks – FCC Briefing

Chris Daniels
General Manager, North America

Patrick Leary
Director, BD, North America

02DEC2015

Telrad
We're on your wavelength.

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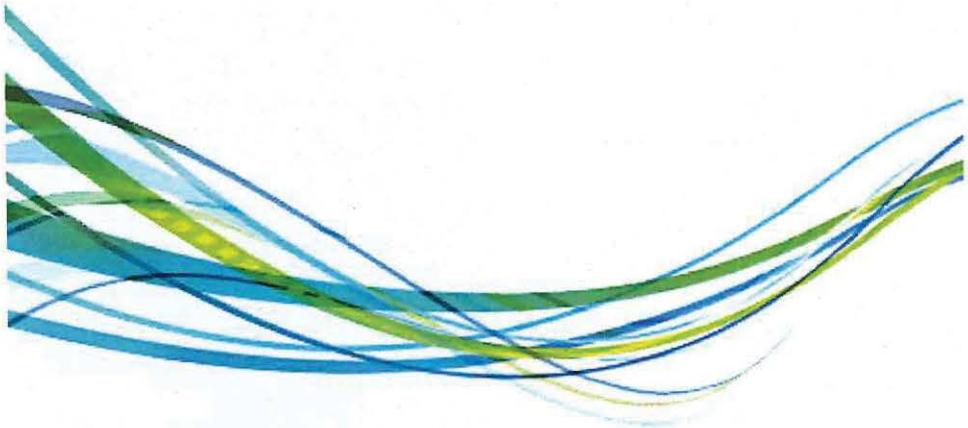
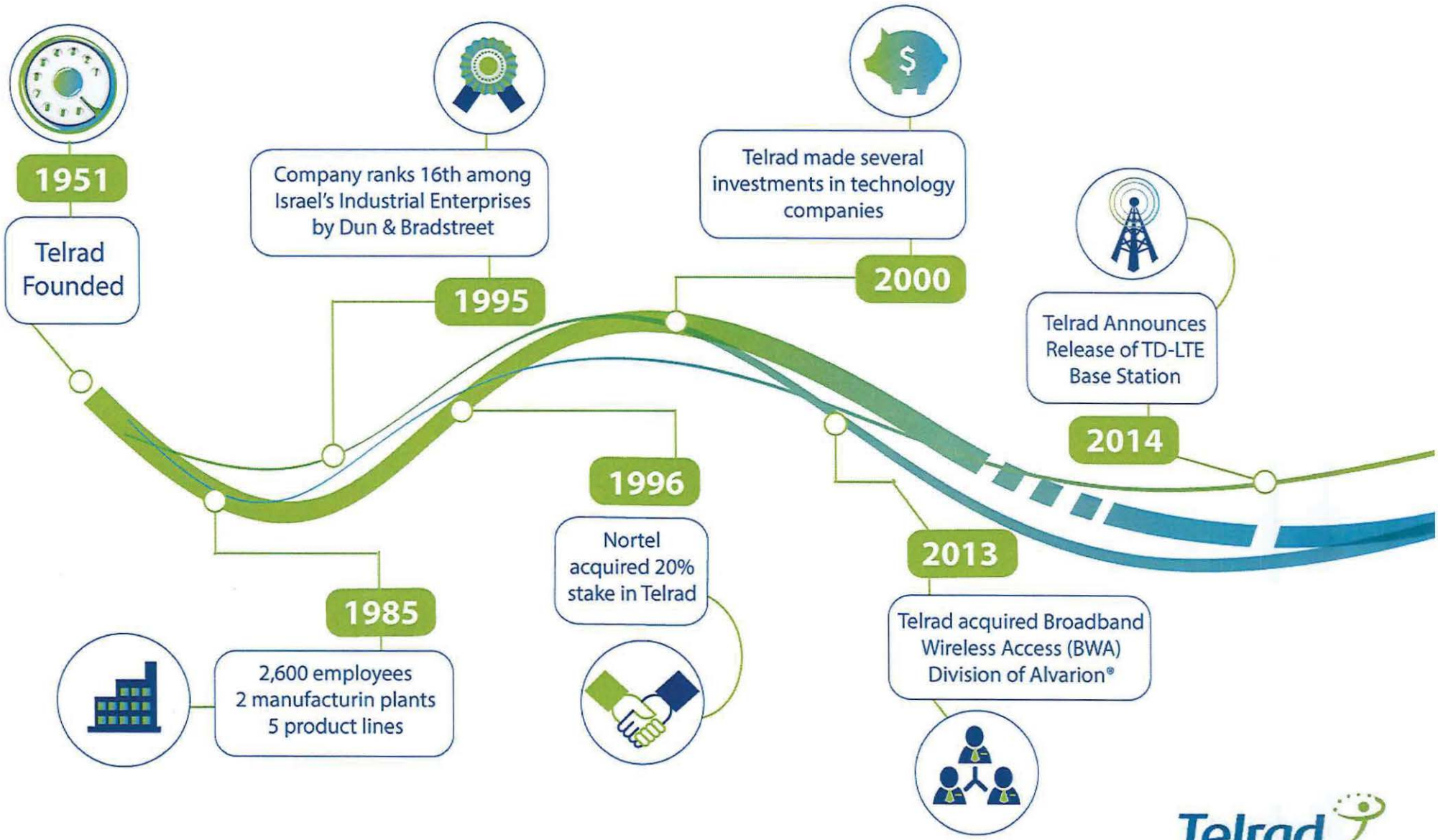


About Telrad

Telrad

Telrad's 60+ Year Telecom Legacy



Telrad

Telrad by the numbers

- **400+** employees worldwide
- **50+** countries: local presence
- **2** subsidiaries: Oasis & Magalcom
- **>3 million** wireless links deployed
- **100's** of enterprise and operator customers worldwide
- **350+** commercial 4G deployments in **150** countries
- Over **130** operators in North America (about 115 U.S.) are running Telrad LTE trials or production networks
  - **This is up from 1 in 01JAN2015**

Magalcom
whatever IT takes

Oasis
When IT (really) matters

Telrad

Telrad's Focus

- Telrad is focused on BWA solutions
  - Broadband Wireless Access
  - Primarily fixed and nomadic applications
  - Mobile is also supported but not the primary driver
- Telrad is focused on innovative services
  - Telrad NOC (T-NOC)
  - Caching solutions for optimal network performance
  - Private cloud
- Telrad serves two main market segments
  - Rural broadband operators
  - Small and mid-sized municipalities

Telrad is Defining Fixed LTE

- Others in LTE are focused on tier-1 mobile networks
  - 4G/5G FD-LTE, HetNet, and Small cell focused
  - Fixed applications are an afterthought
  - Key features are missing for fixed
  - Core is extremely complicated
- Telrad is providing a solution to meet the needs of fixed applications
  - More relevant base station technology
  - Less complex core
  - Consistent performance and user experience
  - Layer 2 and static IP services
  - More appropriate feature set at a more appropriate cost

The Telrad Solution

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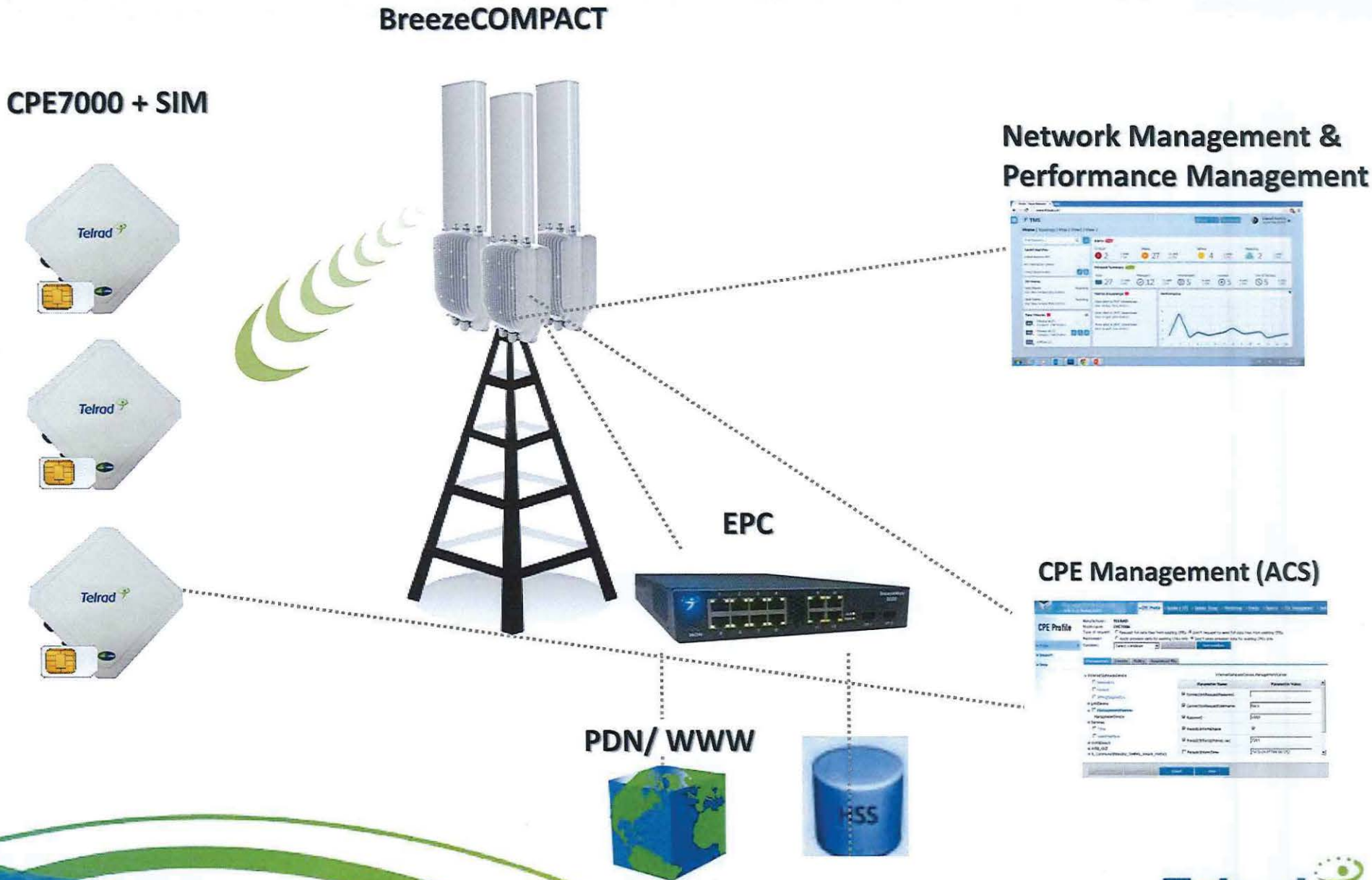
Telrad LTE Solution Overview



RAN

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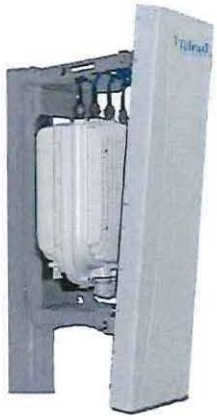
Compact 1000

	COMPACT 1000	COMPACT 1000	COMPACT 1000
Frequency	3.4 – 3.7 GHz	4.9 – 5.35 GHz	5.47 – 5.95 GHz
Radio Configuration	4TX x 4RX	4TX x 4RX	4TX x 4RX
Transmit Power *(Per Port)*	30dBm	20dBm	20dBm
Weight	8 kg	8 kg	8 kg
Dimensions	242.7 x 343 x 166.9mm	242.7 x 343 x 166.9mm	242.7 x 343 x 166.9mm
Power Consumption	100W	100W	100W
Primary Interfaces	1 x RJ-45 1Gb Copper 1 x RJ-45 1Gb Optical SFP GPS In/Out	1 x RJ-45 1Gb Copper 1 x RJ-45 1Gb Optical SFP GPS In/Out	1 x RJ-45 1Gb Copper 1 x RJ-45 1Gb Optical SFP GPS In/Out



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Compact 3000

	COMPACT 3000 (WCS)	COMPACT 3000	COMPACT 3000
Frequency	2.3-WCS: 2305 - 2317, 2348 - 2360 MHz	2.496-2.690GHz	3.475-3.7GHz
Radio Configuration	4TX x 4RX	4TX x 4RX	4TX x 4RX
Transmit Power (Per Port)	40dBm	40dBm	40dBm
Weight	19 kg	19 kg	19 kg
Dimensions	400 x 260x 330 mm	400 x 260x 330 mm	400 x 260x 330 mm
Power Consumption	230W	230W	230W
Primary Interfaces	1 x RJ-45 1Gb Optical SFP GPS In/Out	1 x RJ-45 1Gb Optical SFP GPS In/Out	1 x RJ-45 1Gb Optical SFP GPS In/Out

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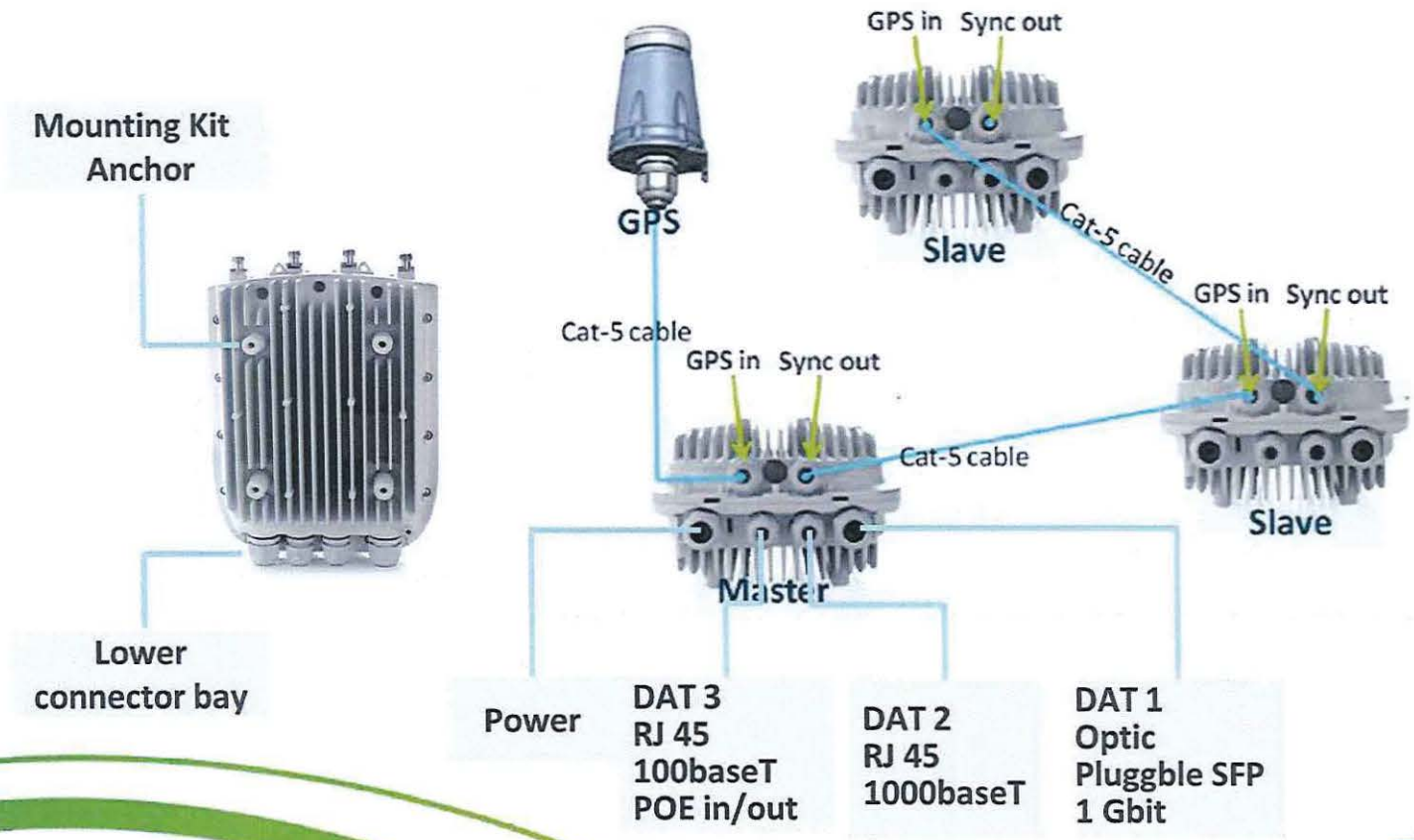
High End Hardware

- Compact, interface-rich, high end DSPs, 4x4, 30 dBm/RF port

Holds QAM 64 up until -83.5 RSSI. By contrast PMP450 loses that modulation and coding at -75 RSSI. ***Range per modulation is the only question that matters when people brag about speeds.***



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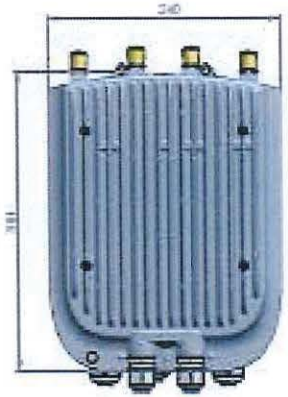
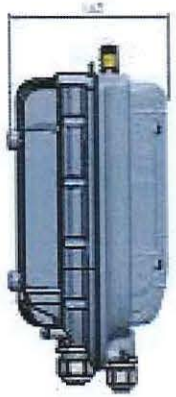
Future-Proof Solution

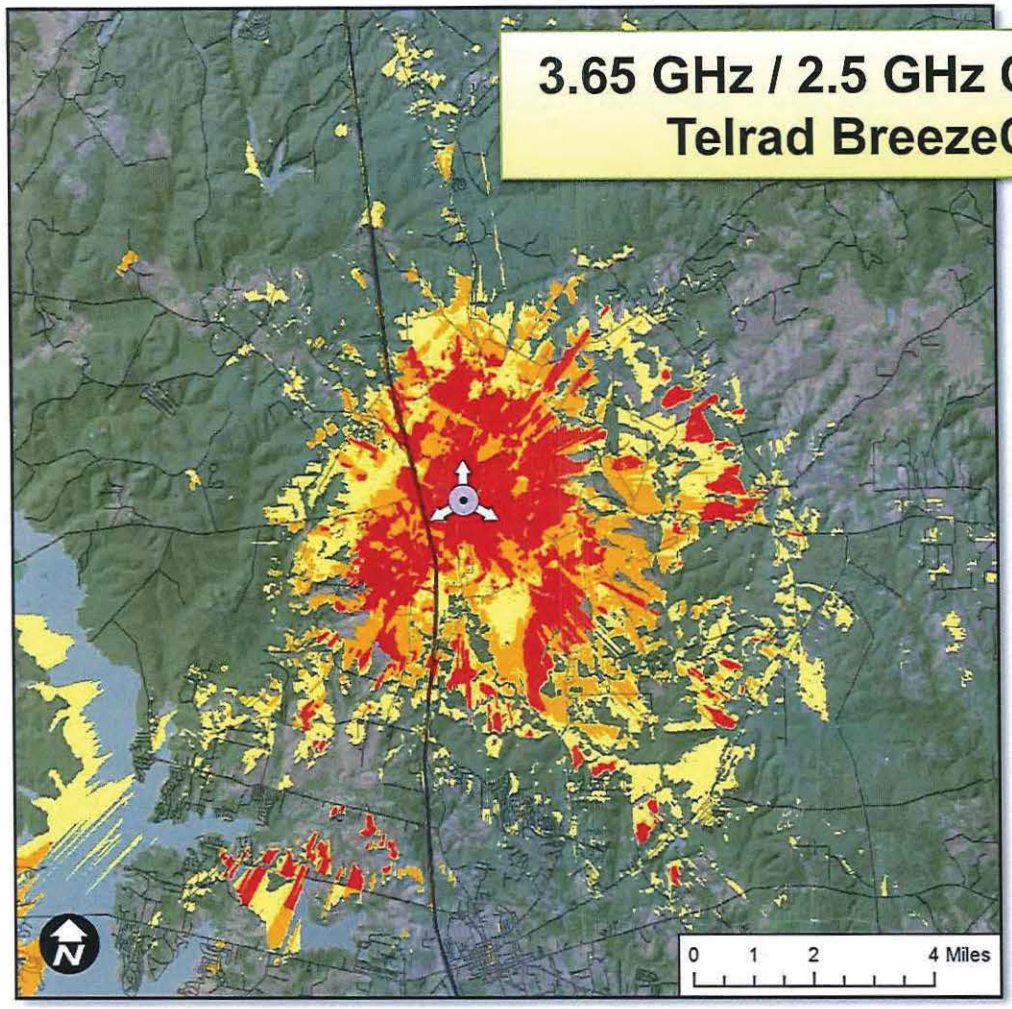
Fully SDR, FPGA-based with multi-core processors able to support evolving LTE standards and a fully-embedded core in a single, compact form factor.

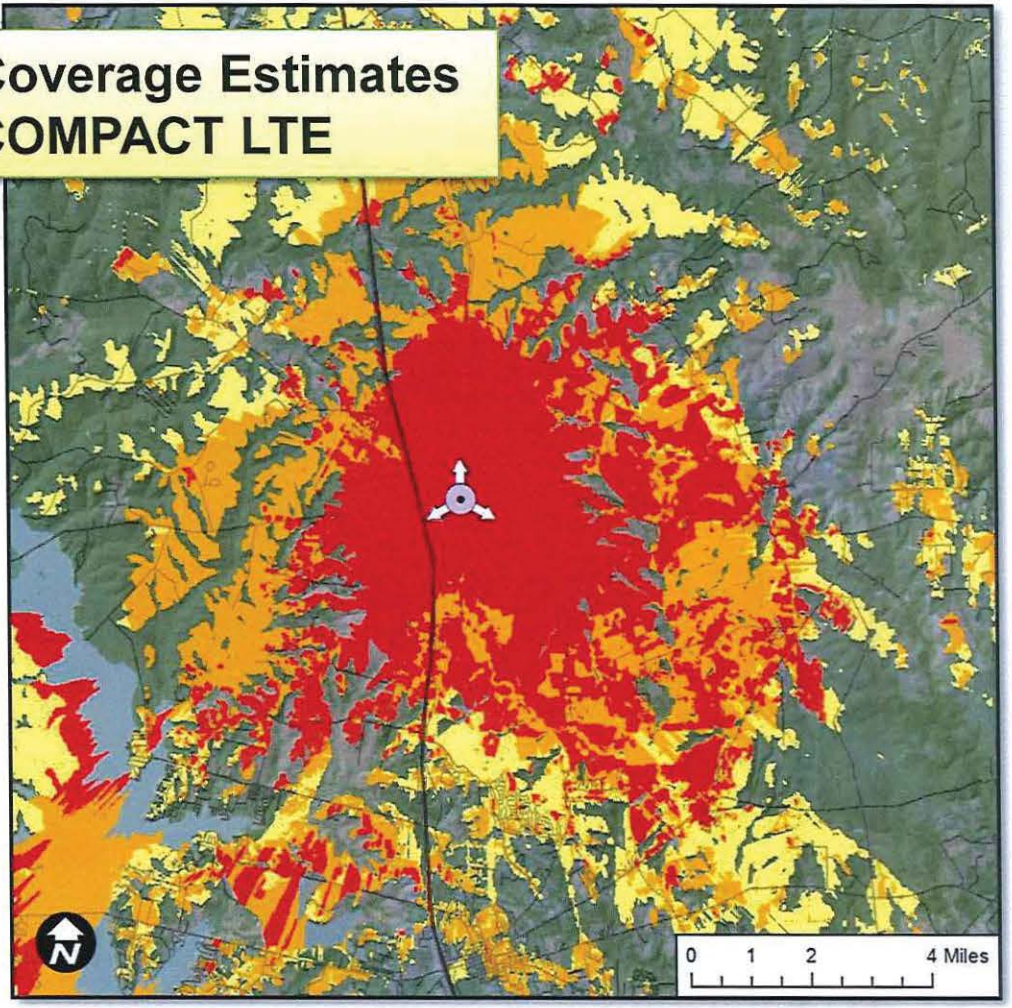
- Essentially makes the CAPEX investment extendable 5-7 years instead of the normal 2-3 years.
- In other words, like getting 2 generations of infrastructure without another climb or forklift.





3.65 GHz / 2.5 GHz Coverage Estimates
Telrad BreezeCOMPACT LTE





Site

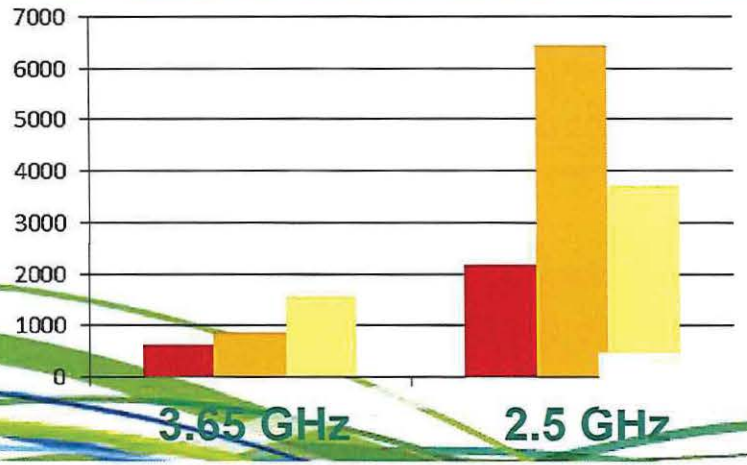
BreezeCOMPACT Sector

Field Strength Prediction

Estimated Speeds

- 20+ Mbps
- 5+ Mbps
- Potential Service
- Unlikely Service

Estimated Household Counts

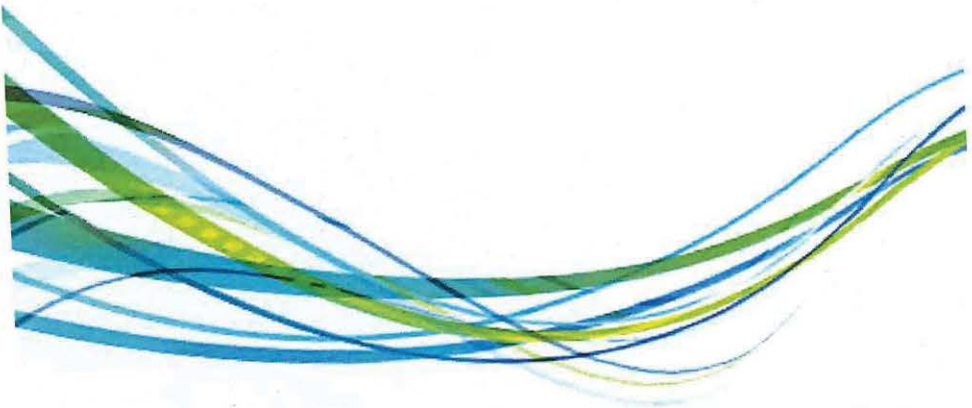


Higher Output Power and **Lower Frequency** result in better penetration, coverage, and ultimately *more potential customers being reached.*

Owned License means **no outside interference**

Select Spectrum

AfterTelrad GIS



CPE

Telrad

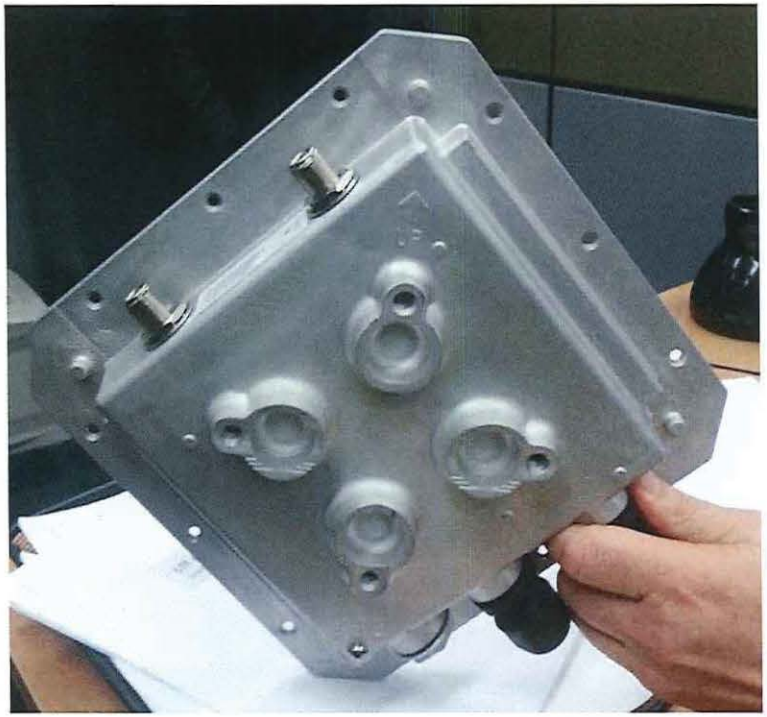
CPE7000 CPE Portfolio

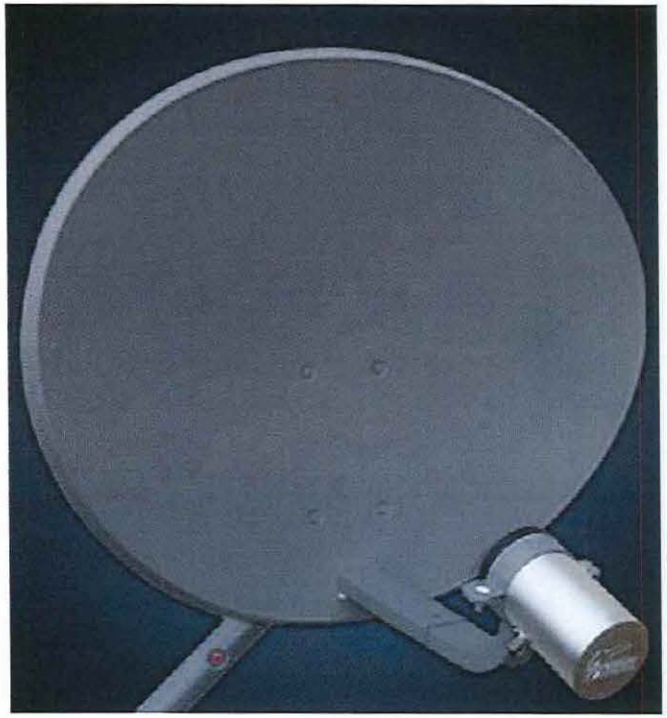
Specifications	
Data and Voice Capabilities	1 Data + 2 Voice lines
Frequency	3.4-3.8GHz (B42, B43) *2.3-2.7GHz (B40, B41)*
Radio Configuration	1TX x 2RX
Transmit Power	27dBm WiMAX *23dBm LTE (14dBm 2.3GHz)*
Weight	1.2 kg
Internal Antenna Gain	15dBi
Power Consumption	7 W
Environmental standard	*IP67*

3GPP limitation: Tx Power of 23dbm (WiMAX is 27dbm)

Connectorized CP7000

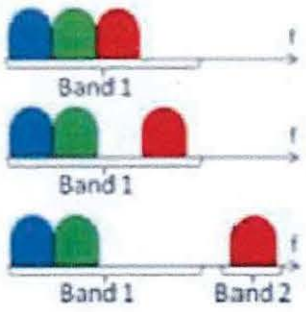
- The CPE7000 may be ordered with N type connectors for the purpose of connecting an external antenna.

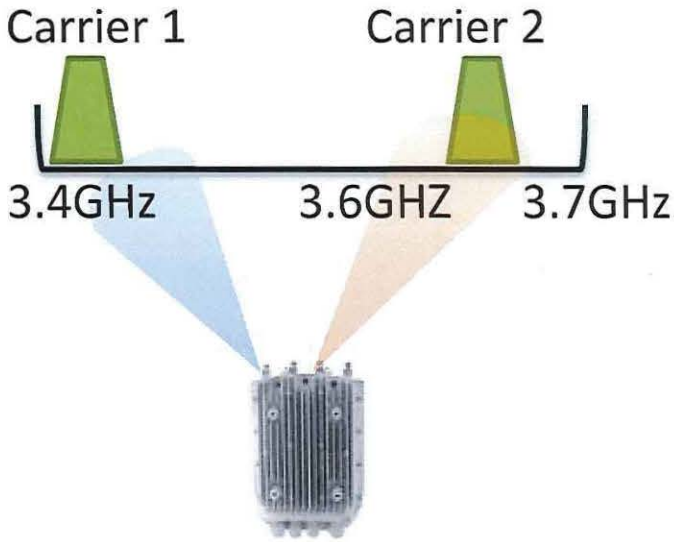




Advanced Feature Set

- Carrier aggregation
  - Intra-band, contiguous
  - Intra-band, non-contiguous
  - Inter-band, non-contiguous





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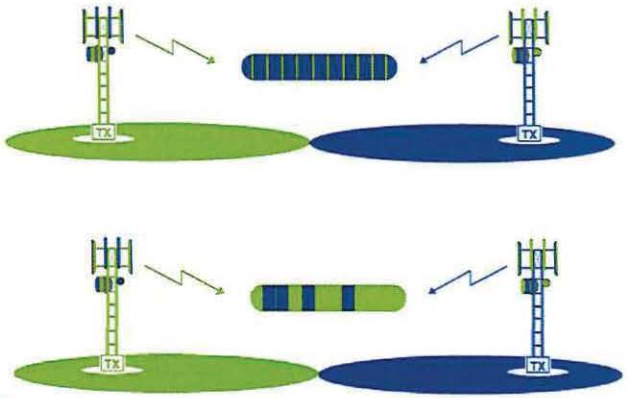
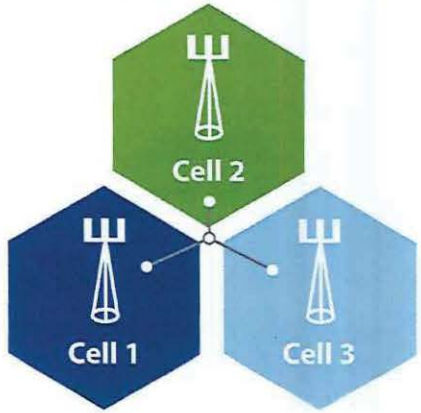
Advanced Feature Set

- Carrier aggregation
- Coordinated Multipoint (COMP)
  - Addresses Cell-edge issues
  - Leverages multiple eNB that are geographically separated
  - Coordinates of transmission and reception between a UE these eNBs





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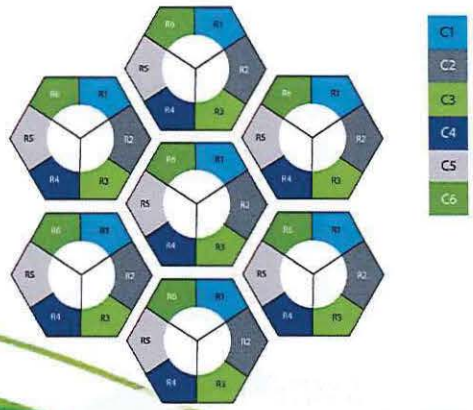
Advanced Feature Set

- Carrier aggregation
- Coordinated Multipoint (COMP)
- Enhanced Inter-Cell Interference Coordination (eICIC)
  - Will mitigate cell edge interferences
  - Scheduling coordinated between eNB for cell edge UE based on frequency, power and time domain.



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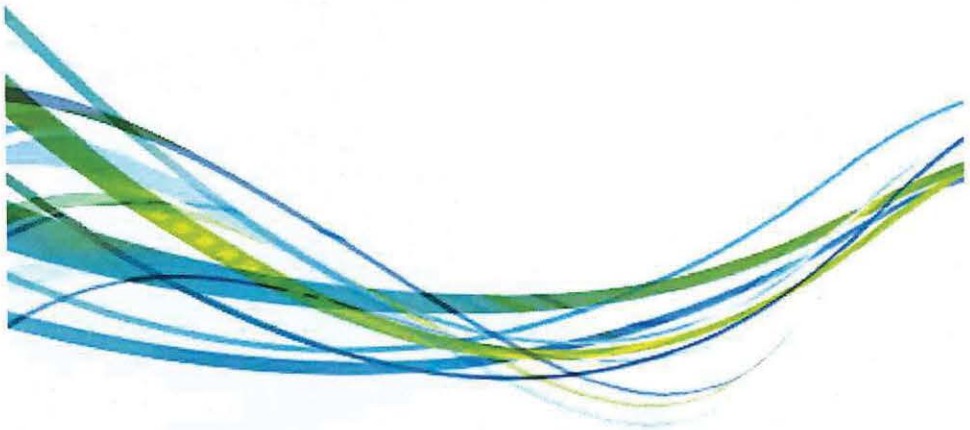
Highly Scalable

- The LTE Evolved Packet system is designed with unlimited scalability
- Enhanced feature set enables a high level of scalability
  - SON - Allows operators to rapidly deploy as eNB can measure noise and interference from other eNB and adapt to optimal configurations
  - eICIC - allows for higher order frequency reuse by enabling Frequency, power and time coordination at the cell edge
  - Carrier aggregation - allows operators to enable additional capacity as required
  - Evolved packet core allows for rapid expansion and can scale to service multiple PDNs



We Encourage Best Practices

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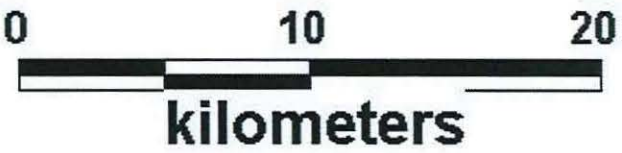
Rural Deployment

- 65 Degrees Antenna
  - 3 Sectors
  - 3 Channels

Range			Color	Distribution
Min	to	-98dB		4.299 %
-98dB	to	-95dB		1.621 %
-95dB	to	-92dB		1.733 %
-92dB	to	-89dB		1.86 %
-89dB	to	-86dB		2.318 %
-86dB	to	-81dB		3.383 %
-81dB	to	-80dB		0.479 %
-80dB	to	Max		84.303 %



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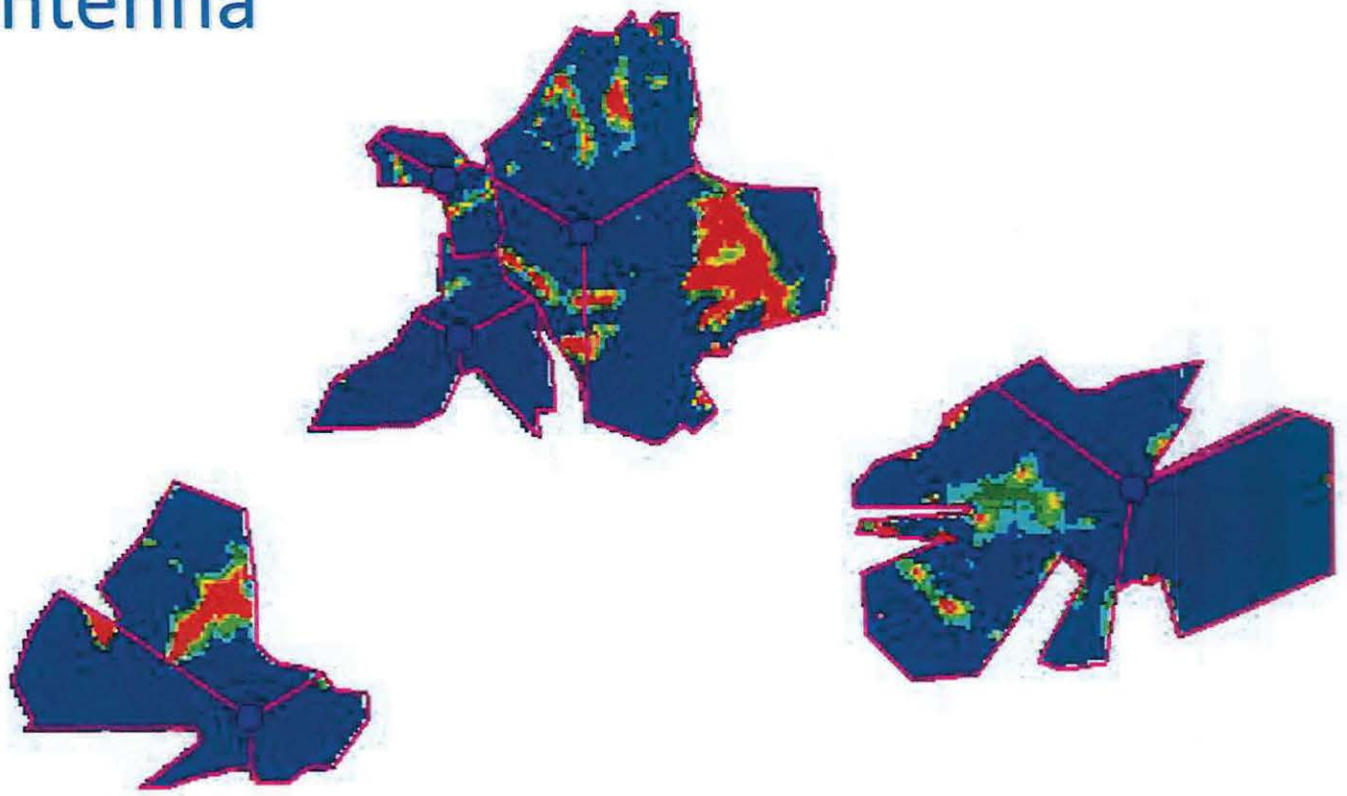
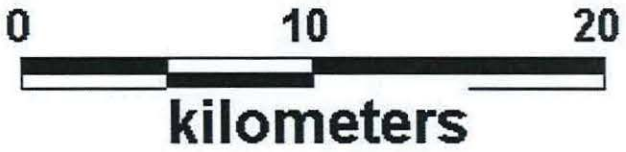
Rural Deployment

- 90 Degrees Antenna
  - 3 Sectors
  - 3 Channels



Range			Color	Distribution
Min	to	-98dB		4.99 %
-98dB	to	-95dB		1.529 %
-95dB	to	-92dB		1.691 %
-92dB	to	-89dB		1.881 %
-89dB	to	-86dB		2.382 %
-86dB	to	-81dB		3.08 %
-81dB	to	-80dB		0.465 %
-80dB	to	Max		83.979 %



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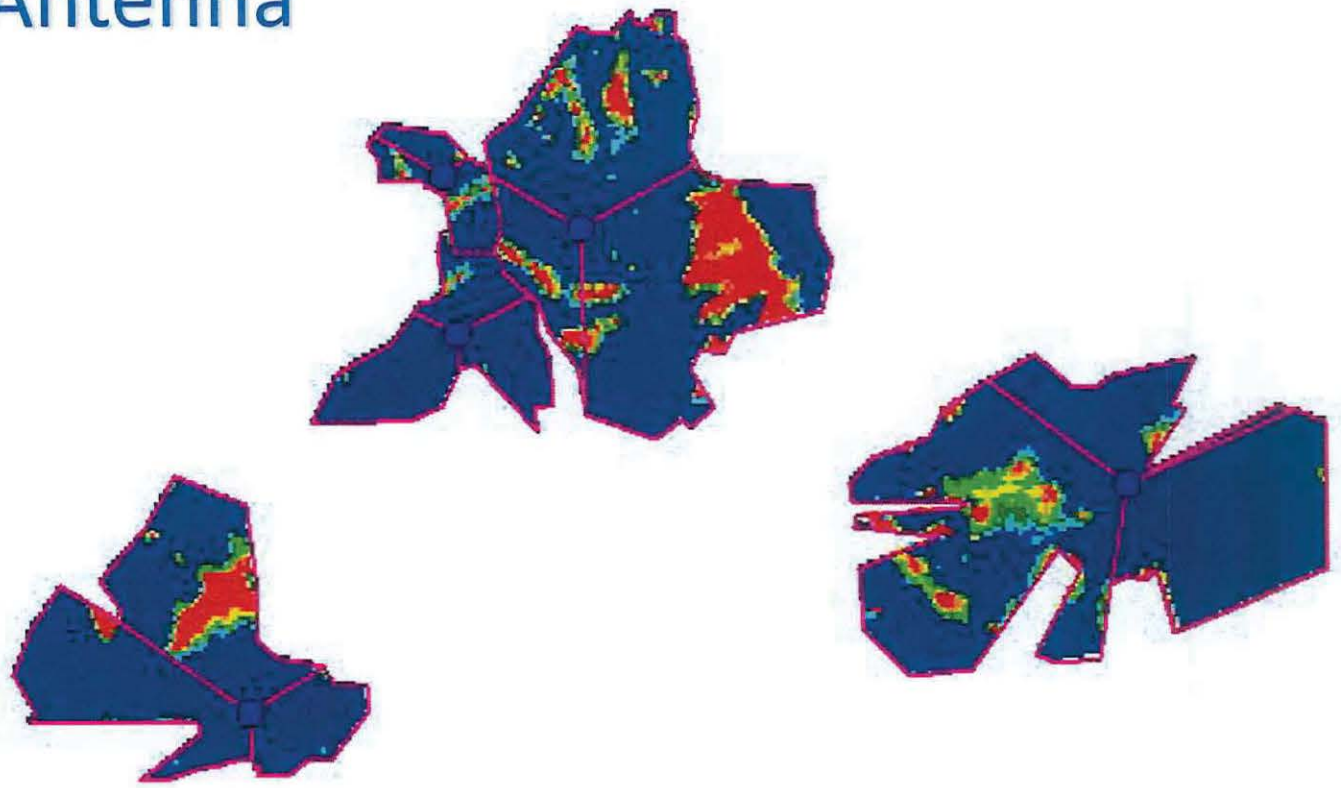
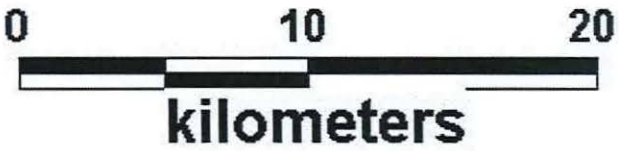
Rural Deployment

- 120 Degrees Antenna
  - 3 Sectors
  - 3 Channels



Range			Color	Distribution
Min	to	-98dB		6.265 %
-98dB	to	-95dB		1.705 %
-95dB	to	-92dB		2.1 %
-92dB	to	-89dB		2.445 %
-89dB	to	-86dB		2.043 %
-86dB	to	-81dB		2.234 %
-81dB	to	-80dB		0.415 %
-80dB	to	Max		82.788 %



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Rural Deployment

- Area Simulations Results
  - **Comparing between Antennas**

No. of Sectors	3	3	3
Antenna Degrees	65 Deg.	90 Deg.	120 Deg.
Sector Bandwidth Reuse	1	1	1
Modulation	DL	DL	DL
BPSK ½	1.6%	1.5%	1.7%
BPSK ¾	0.0%	0.0%	0.0%
QPSK ½	1.7%	1.7%	2.1%
QPSK ¾	1.9%	1.9%	2.4%
QAM16 ½	2.3%	2.4%	2.0%
QAM16 ¾	3.4%	3.1%	2.2%
QAM64 2/3	0.5%	0.5%	0.4%
QAM64 ¾	**84.3%**	**84.0%**	**82.8%**
Total	**95.7%**	**95.01%**	**93.7%**

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Market Insights

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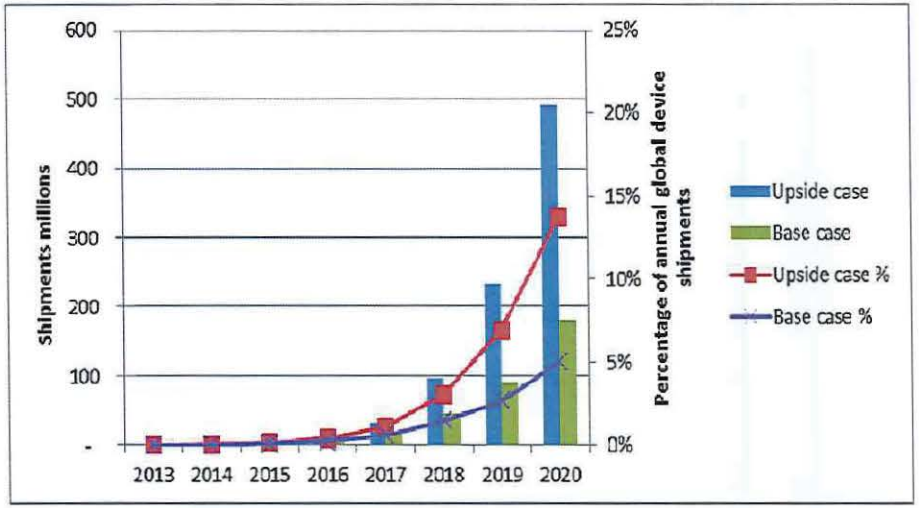
Standard Driven by a Mass Global Market

- End-user ecosystem driven by a mass consumer market
  - Greater end-user device options
  - Cost decreases as the market grows
- Standards based interoperability protects your investment
  - Fate of your network is not tied to an individual company
  - Option to leverage multiple vendors



Forecast of Global Shipments - Band 42/43 Devices. Source: *Innovation Observatory.*

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And How is Telrad Doing?

Over 130 LTE deployments, from zero Jan. 1, 2015.

That's roughly 8% of the WISP market in one year.

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Key Drivers to Our Market Adoption

#1 – NLOS

NLOS is a major problem, made critically acute since streaming forced higher broadband needs so 900 MHz systems can no longer meet the capacity requirements of modern Internet usage.

#2 – Market Preparation for 3.55 GHz

Operators looking for solutions they are certain will be be able to leverage the new band.

Market learning that LTE will dominate and do not want to be left behind

What Else is Driving This Success?

- Product Reasons
  - NLOS abilities
  - Revolutionary hardware
  - Fixed-centric LTE
  - Game-changing EPC model
  - Comprehensive CPE w/no speed caps
- Market Reasons
  - Broadband definitions increasing
  - Market uptake of streaming applications/OTT
  - LTE taking over
  - IoT pushing intelligence and connectivity to the edge in scale
  - Legacy solutions deliver very poor NLOS

NLOS Examples

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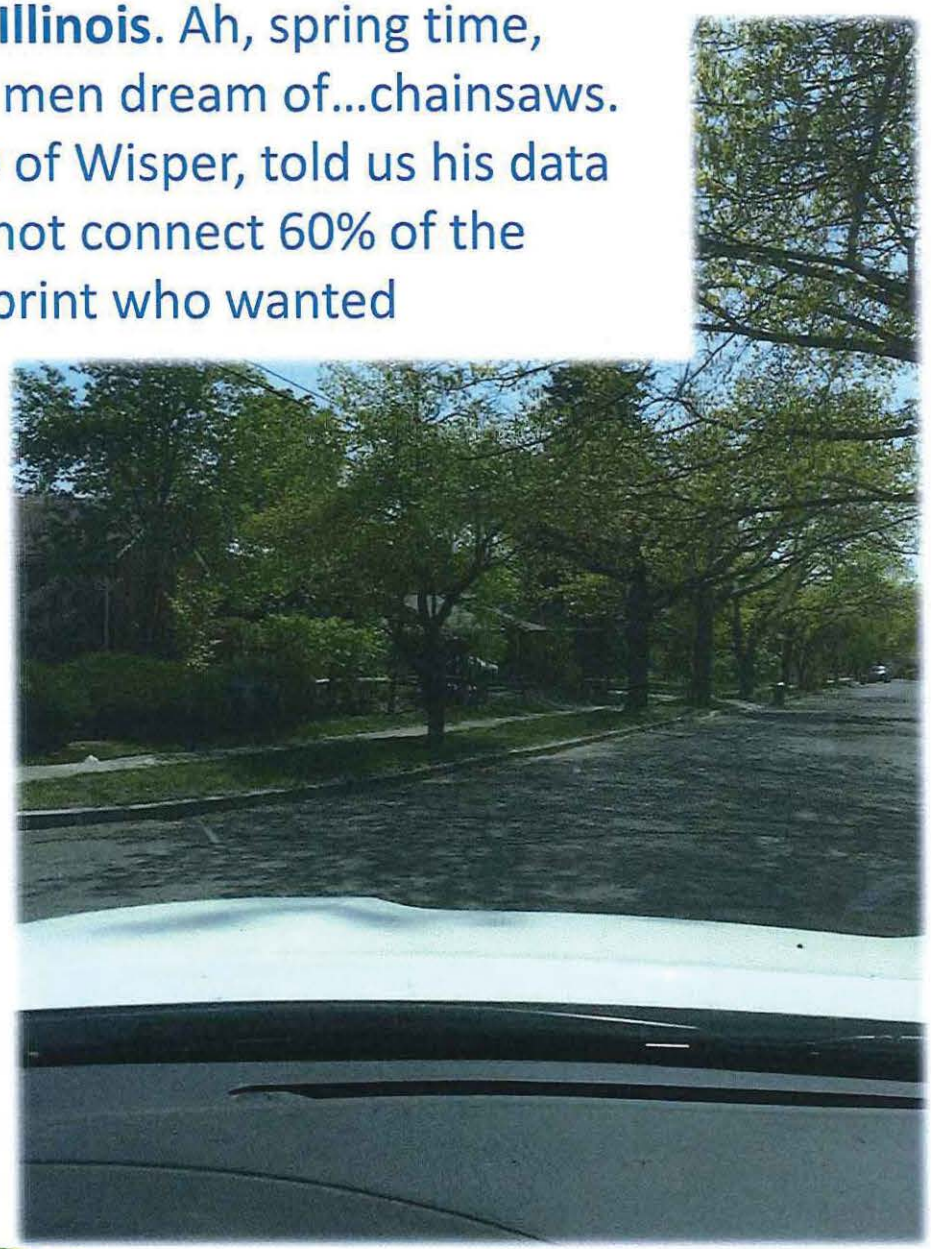
SOFTCOM in CA. The eucalyptus trees were imported from Australia a century ago and they've taken over. Now the area is serviceable.

Telrad

WISPER Internet in Illinois. Ah, spring time, when young (WISP) men dream of...chainsaws. Nathan Stooke, CEO of Wisper, told us his data showed they could not connect 60% of the people in their footprint who wanted service...*until now.*



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Getting through this was more rare than a bigfoot sighting, but in this test, **Skywerx** technicians **in Durango, CO** was streaming the ***Transformers*** movie without a *burb...even with the CPE just laying there like this..*

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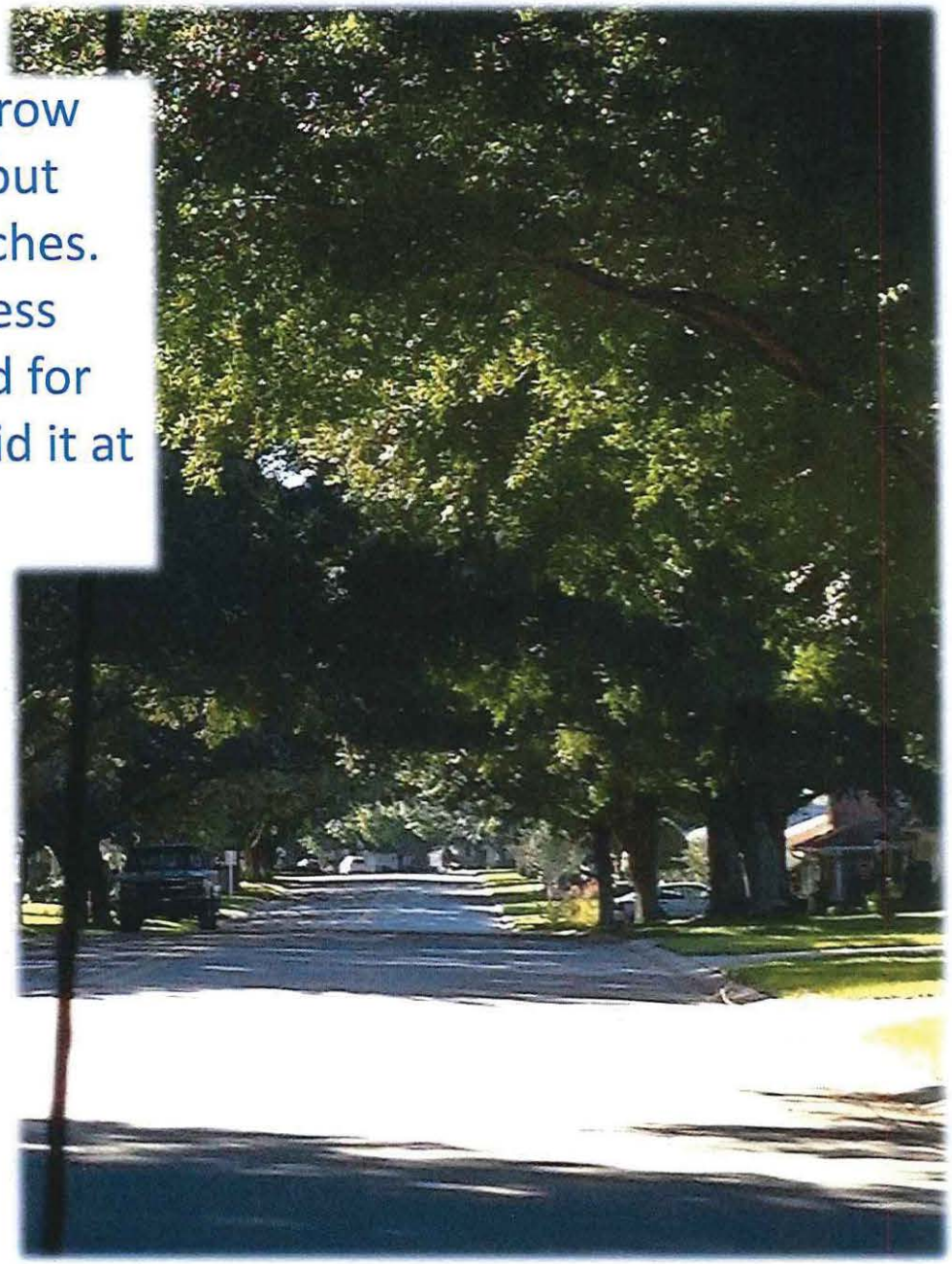
BridgeNet in Ocala, FL. Live Oaks grow up to cover the streets in a lovely, but impenetrable, interlocking of branches. Nothing got through this, even at less than 1 mile, and the customer tried for 18 months…until we did, and we did it at -77, which is QAM 64 ½.



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More from BridgeNET, from the tower and one from the CPE. This CPE registers as -67.

BridgeNet can connect anything in a 3 mile radius from this tower and connect at -75 or better.

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Parting Considerations

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What is "LTE"?

- Not all LTE that will be used in the license-exempt and CBRS bands will be mobile centric "LTE-U" or "LAA"
- Not all LTE deployed in the WCS, 700 MHz, and/or the EBS/BRS bands will be mobile-focused

The rural broadband market is very concerned the rules will be tilted in favor of the mobile operators, which will put at risk the broadband service of millions of rural broadband consumers.

Thank You!

www.telrad.com

Telrad

We're on your wavelength.